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UTILITY PATENT APPLICATION TRANSMITTAL
 (Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. RCA 90,038
 First Inventor or Application Identifier Duggan
 Title SPHERICAL MOUNTING SYSTEM FOR THREE AXIS PROJECTION ASSEMBLY IN A PROJECTION ASSEMBLY
 Express Mail Label No. ET 479513314US

APPLICATION ELEMENTS
 See MPEP chapter 600 concerning utility patent application contents.

- Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original and a duplicate for fee processing)
- Specification [Total Pages 11]
 - Descriptive title of the invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the invention
 - Brief Summary of the invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
- Drawing(s) (35 U.S.C. 113) [Total Sheets 4]
- Oath or Declaration [Total Pages 15]
 - Newly executed (original or copy)
 - Copy from a prior application (37 C.F.R. § 1.63(d)) (for continuation/divisional with Box 16 completed)
 - DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

ADDRESS TO: Assistant Commissioner for Patents
 Box Patent Application
 Washington DC 20231

- Microfiche Computer Program (Appendix)
- Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)
 - Computer Readable Copy
 - Paper Copy (identical to computer copy)
 - Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

- Assignment Papers (cover sheet & document(s))
- 37 C.F.R. § 3.73(b) Statement of Power of Attorney (when there is an assignee)
- English Translation Document (if applicable)
- Information Disclosure Statement (IDS)/PTO-1449 Copies of IDS Citations
- Preliminary Amendment
- Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
- Small Entity Statement(s) Statement filed in prior application, Status still proper and desired (PTO/SB/09-12)
- Certified Copy of Priority Document(s) (if foreign priority is claimed)
- Other: _____

***NOTE TO INVENTORS:** IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28)

16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:
 Continuation Divisional Continuation-in-part (CIP) of prior application No: _____
 Prior application information: Examiner _____ Group / Art Unit: _____
 For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

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**SPHERICAL MOUNTING SYSTEM FOR THREE AXIS ADJUSTMENT OF A
LIGHT PROJECTOR ASSEMBLY IN A PROJECTION TELEVISION**

5 This application claims the benefit of U.S. Provisional Application No. 60/178,329,
filed January 27, 2000, entitled "Spherical Mounting Detail For Adjusting Three Axis of
Rotation Without Affecting Centering".

BACKGROUND OF THE INVENTION

10 The present invention relates to projection televisions, and more particularly, to a
spherical mounting system for three axis rotational adjustment of a light projector assembly
in a projection television without affecting centering of the TV image on the screen of the
television.

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15 A conventional projection television (TV) typically consists of a plurality of critical
optical components mounted in a multi-part cabinet structure. The optical components
commonly include a light projector assembly for generating television images, a screen for
viewing the images, and a large mirror (often combined with a smaller mirror) for directing
the images generated by the light projector assembly to the screen.

20 Many projection TVs, such as Liquid-Crystal-On-Silicone (LCOS) projection TVs, do
not have the ability to electrically correct geometry errors without causing other problems.
Therefore, it is imperative that the mechanical aiming of the light projector assembly be
adjusted to correct geometry errors. This is typically accomplished by rotationally adjusting
the light projector assembly about its X, Y, and Z axes (three axis rotation).

25 Most conventional methods for three axis rotational adjustment of light projector
assemblies involve the use of three or four separate components. In these methods, adjusting
any one axis can affect picture centering. Accordingly, a method is needed for rotationally
adjusting a light projector assembly of a projection TV in three axes to correct geometry

errors, while maintaining the projector assembly's aim at the virtual center of the TV 's screen.

SUMMARY OF THE INVENTION

5 The invention is directed to a mounting system for three axis rotational adjustment of a light projector assembly of a projection television. The mounting system comprises first and second spherical means which coast with one another to restrict movement of the projector assembly to a portion of a spherical path.

BRIEF DESCRIPTION OF THE DRAWINGS

10 The advantages, nature, and various additional features of the invention will appear more fully upon consideration of the illustrative embodiments now to be described in detail in connection with accompanying drawings wherein:

FIG. 1 is a schematic illustration of a spherical mounting system of the invention;

15 FIG. 2 is a cross-sectional side view of a projection TV employing the mounting system of the invention;

FIG. 3 is a perspective front view of the projection TV of FIG. 2;

FIG. 4 is an exploded cross-sectional side view through the spherical mounting system of the invention;

FIG. 5 is a perspective rear view of the projection TV of FIG. 2; and

20 FIG. 6 is an enlarged section of the spherical bracket that illustrates one of the eccentrics used for finely adjusting the position of the spherical bracket relative to the spherical wall.

It should be understood that the drawings are for purposes of illustrating the concepts of the invention and are not necessarily to scale.

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DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates a spherical mounting system 10 according to the invention, for three axis rotational adjustment of a light projector assembly 22 of a projection TV 20. The projection TV also includes a screen 24 for viewing images generated by the light projector assembly 22, and an upper mirror 26 and a lower mirror 28 for directing the images generated by the light projector assembly 24 to the screen 24.

The spherical mounting system 10 of the invention comprises a first part 12 having a convex spherical engagement surface 14 and a second part 16 having a concave spherical engagement surface 18 which slidably engages the convex spherical surface 14 of the first part 12. The interface of the convex and concave spherical engagement surfaces 14, 18 has a radius R measured from a center P of an imaginary sphere formed by continuing the spherical interface. The spherical mounting system 10 focuses the light projector assembly 22, which is attached to the second part, at the point P which is also equivalent to the center of a screen 24 of the projection TV 20. Thus, point P is referred to as the virtual center of the screen 24. The first part 12 typically comprises a fixed, non-moveable wall element (spherical wall 12) while the second part 16 typically comprises a freely moveable bracket element (spherical bracket 16) that attaches the light projector assembly to the mounting system 10. The spherical bracket 16 can be slidably moved relative to the non-moveable spherical wall 12 while maintaining intimate contact therewith. The spherical mounting system 10 permits rotation of the light projector assembly 22 about the virtual center P of the screen 24 in three axes: X (projecting out from the plane of the drawing), Y, and Z, thereby restricting movement of the projector assembly 22 to a portion of a spherical path and enabling adjustment of an image (picture) generated by the projector assembly on a screen of a projection television to a desired geometry. Once the desired picture geometry has been achieved, the spherical bracket 16 is adapted be locked in place. Since the spherical

engagement surfaces 14, 18 of the mounting system 10 are aimed at the virtual center P of the screen, rotations thereabout do not cause miscentering of the picture on the screen 24.

As illustrated in FIGS. 2 and 3, the spherical wall 12 is preferably incorporated into a cabinet 30 that houses the light projector assembly 22, the screen 24 and the mirrors 26, 28, thus, only requiring the addition of the moveable bracket 16 to achieve the three axis rotation. The cabinet 30 comprises a self-supporting, one-piece, open-front enclosure 32 molded from a plastic material. The enclosure 32 is preferably made using a conventional gas injection molding process which minimizes internal stresses in the enclosure 32 and thus, dimensionally stabilizes the enclosure 32. The lower portion 34 of the enclosure 32 defines a frame section 36 that provides the enclosure 32 with rigidity. The frame section 36 is covered by an inclined top wall 38 and surrounded by a pair of side walls 40 with bottom edges 42 that turn inwardly toward the lower frame section 36. A flange 44 is molded with front edges of the top and side walls 38, 40.

The spherical wall 12 is preferably precision molded into the frame section 36. An aperture 45 in the spherical wall 12 permits the optics 27 of the light projector assembly 22 to extend there through. The spherical wall 12 is disposed laterally between a pair of spaced-apart, boxed frame members 46 and vertically between an angled upper wall 48 and horizontal bottom wall 50. The convex spherical surface 14 faces the rear of the cabinet 30.

The spherical engagement surfaces 14, 18 of the spherical wall 12 and bracket 16 are maintained in intimate contact with one another by spring-type biasing means. The spring-type biasing means permit rotational movement of the spherical bracket 16 relative to the spherical wall 12 about the X, Y, and Z axes. As collectively illustrated in FIGS. 4 and 5, the spring biasing means preferably comprises L-shape spring fingers 52 extending rearwardly from the convex spherical engagement surface 14 of the spherical wall 12. The spring fingers 52 are molded in the corners of the spherical wall 12 (FIG. 5) and clamp the spherical bracket

16 to the spherical wall 12. The inner surfaces of the fingers 52 can include interference bumps 54 (FIG. 4) which concentrate the biasing force exerted by the fingers against the back surface 56 of the spherical bracket 16.

The spherical bracket 16 includes an aperture 58 encircled by a raised flange 60 extending from the back surface 56 that attaches the light projector assembly 22 to the spherical bracket 16. The aperture 56 of the spherical bracket 16 cooperates with the aperture 45 in the spherical wall 12 to permit the optics 27 of the light projector assembly 22 to extend through the mounting system 10 and face the angled lower mirror 28 so that images generated by the projector assembly 22 can be directed to the screen 24 as shown in FIG. 2.

The spherical mounting system 10 further includes means for finely adjusting the position of the spherical bracket 16 relative to the spherical wall 12. The position adjustment means include three eccentrics 64a, 64b, 64c that coast with three cam slots 62a, 62b, 62c formed in the spherical bracket, two of which are collinear (62a, 62c) and one that is perpendicular (62b). Each eccentric 62a, 62b, 62c includes an eccentric cam 66 with an off-center cylindrical cam drive member 68 extending from one surface thereof. The cam drive members 68 extend through corresponding cylindrical apertures (not shown) in the spherical wall 12. The cams 66 of the eccentrics 64a, 64b, 64c are seated in their respective cam slots 62a, 62b, 62c of the spherical bracket 16. The position of the spherical bracket 16 is finely adjusted relative to the spherical wall 12 by turning one or more of the eccentrics 64a, 64b, 64c.

By adjusting the position of the spherical bracket 16 relative to the spherical wall 12, one can rotate the light projector assembly 22 about the virtual center P (FIG. 1) to adjust the image or picture at the screen 24 to a desired geometry. More specifically, turning eccentrics 64A & 64C in concert with each other to lift one side and lower the other side of spherical bracket 16 rotates the light projector assembly 22 about the Z axis thereby providing true 1-

to-1 rotation at the screen 24. Turning eccentric 64B rotates the light projector assembly 22 about the Y axis thereby providing "trapezoidal" adjustment at the screen 24. Turning eccentrics 64A & 64C in concert with each other to lift or lower spherical bracket 16 rotates the light projector assembly 22 about the X axis thereby providing "keystone" adjustment at the screen 24. Accordingly, the spherical mounting system enables the light projector assembly 22 to be rotationally adjusted to correct geometry errors in the image generated thereby, while maintaining the projector assembly's aim at the virtual center of the screen 24.

While the foregoing invention has been described with reference to the above embodiments, various modifications and changes can be made without departing from the spirit of the invention. Accordingly, all such modifications and changes are considered to be within the scope of the appended claims.

CLAIMS

What is claimed is:

5 1. A mounting system for a light projector assembly of a projection television,
the mounting system comprising:

 first spherical means; and

 second spherical means;

 wherein the first and second spherical means coact with one another to restrict
10 movement of the light projector assembly to a portion of a spherical path.

 2. The mounting system according to claim 1, wherein the restricted movement
of the light projector assembly enables geometry errors in the image generated thereby to be
corrected to the desired geometry while maintaining the projector assembly's aim at a virtual
15 center of the screen.

 3. The mounting system according to claim 1, wherein the first spherical means
comprises a spherical wall.

20 4. The mounting system according to claim 3, wherein the spherical wall is part
of a projection television cabinet of the projection television.

 5. The mounting system according to claim 3, wherein the spherical wall
includes a spherical surface.

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6. The mounting system according to claim 3, wherein the second spherical means comprises a spherical bracket.

7. The mounting system according to claim 6, wherein the spherical wall includes a first spherical surface and the spherical bracket includes a second spherical surface which slidably engages the first spherical surface of the wall.

8. The mounting system according to claim 6, further comprising adjusting means for finely adjusting the location of the spherical bracket relative to the spherical wall.

9. The mounting system according to claim 8, wherein the adjusting means include eccentrics that coact with apertures and cam slots respectively formed in the spherical wall and bracket.

10. The mounting system according to claim 1, wherein the second spherical means comprises a spherical bracket.

11. The mounting system according to claim 10, wherein the spherical bracket includes a spherical surface.

12. The mounting system according to claim 1, further comprising adjusting means for finely adjusting the position of the second spherical means relative to the first spherical means.

13. The mounting system according to claim 12, wherein the adjusting means include eccentrics that coact with apertures and cam slots respectively formed in the first and second spherical means.

5 14. A mounting system for three axis rotational adjustment of a light projector assembly of a projection television, the mounting system comprising:
a spherical wall; and
a spherical bracket for attaching a light projector to the mounting system, the spherical bracket slidably engaged with the spherical wall and moveable relative thereto;
10 wherein the spherical wall and bracket coact with one another to rotate the light projector assembly along three axes, thereby restricting movement of the projector assembly to a portion of a spherical path and enabling adjustment of an image generated by the projector assembly on a screen of a projection television to a desired geometry.

15 15. The mounting system according to claim 14, wherein the restricted movement of the light projector assembly to a portion of a spherical path enables geometry errors in the image generated thereby to be corrected to the desired geometry while maintaining the projector assembly's aim at a virtual center of the screen.

20 16. The mounting system according to claim 14, wherein the spherical wall includes a spherical surface.

17. The mounting system according to claim 14, wherein the spherical bracket includes a spherical surface.

18. The mounting system according to claim 14, wherein the spherical wall includes a spherical surface and the spherical bracket includes a spherical surface which slidably engages the spherical surface of the wall.

5 19. The mounting system according to claim 14, further comprising adjusting means for finely adjusting the position of the spherical bracket relative to the spherical wall.

20. The mounting system according to claim 19, wherein the adjusting means include eccentrics that coact with apertures and cam slots respectively formed in the spherical wall and bracket.

21. The mounting system according to claim 14, wherein the spherical wall is a member of a projection television cabinet of the projection television.

15 22. The mounting system according to claim 14, wherein the spherical bracket includes means for attaching the light projector assembly to the mounting system.

ABSTRACT OF THE DISCLOSURE

A mounting system for three axis rotational adjustment of a light projector assembly of a projection television, the mounting system having a spherical wall and a spherical bracket slidably engaged with the spherical wall and moveable relative thereto. The wall and bracket coact with one another to rotate the light projector assembly about three axes, thereby restricting movement of the projector assembly to a portion of a spherical path and enabling adjustment of an image generated by the projector assembly on a screen of a projection television to a desired geometry without affecting picture centering.

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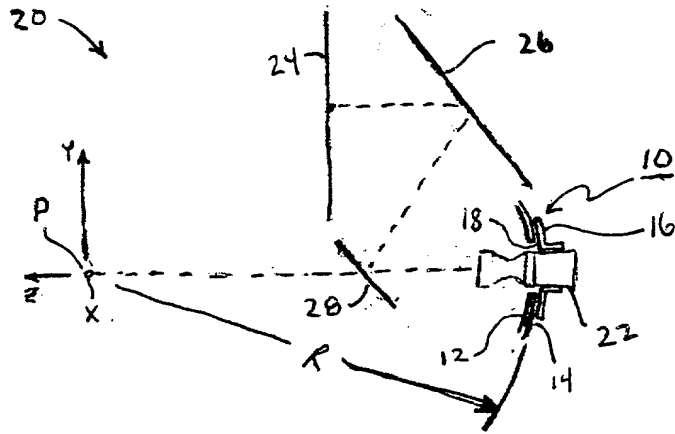


Fig. 1

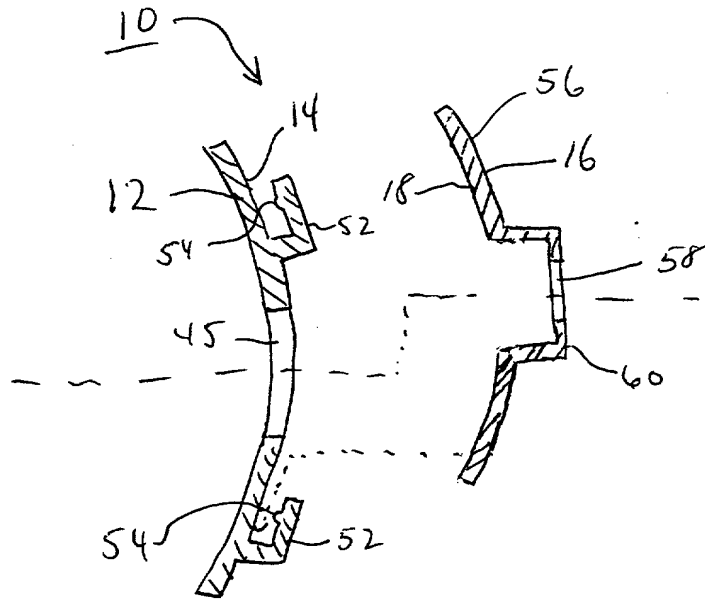


Fig. 4

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007200" 20000000

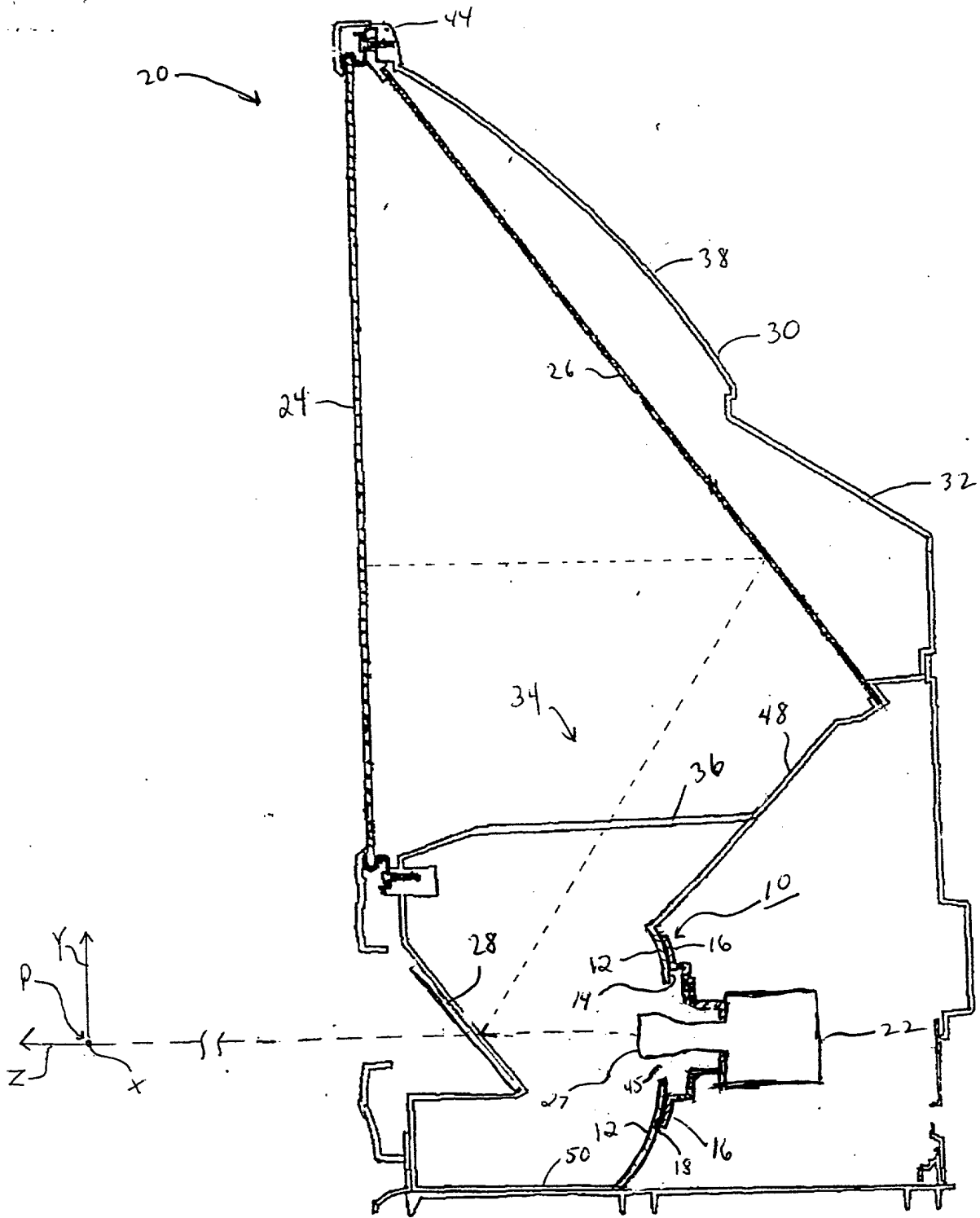


Fig. 2

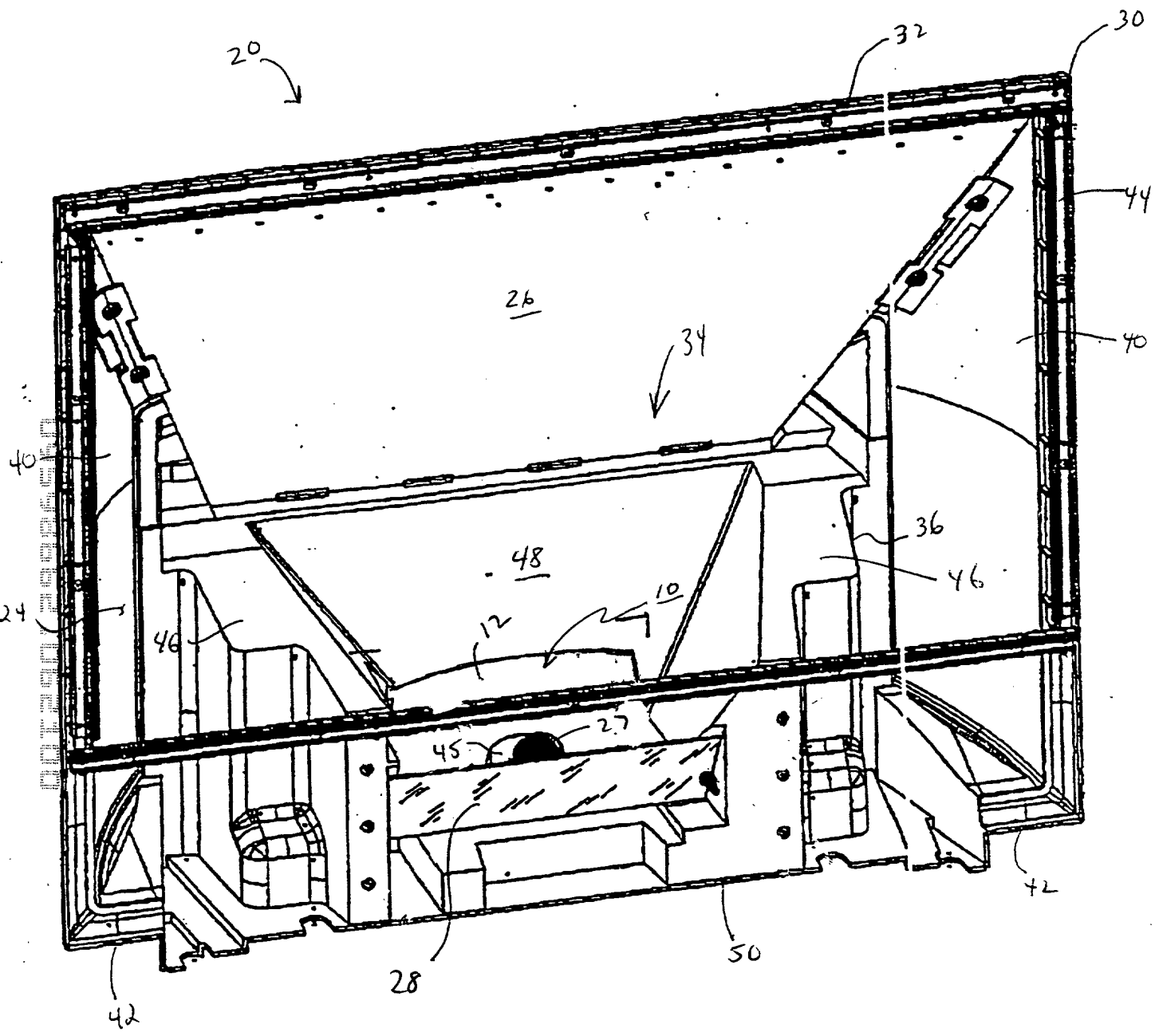


Fig. 3

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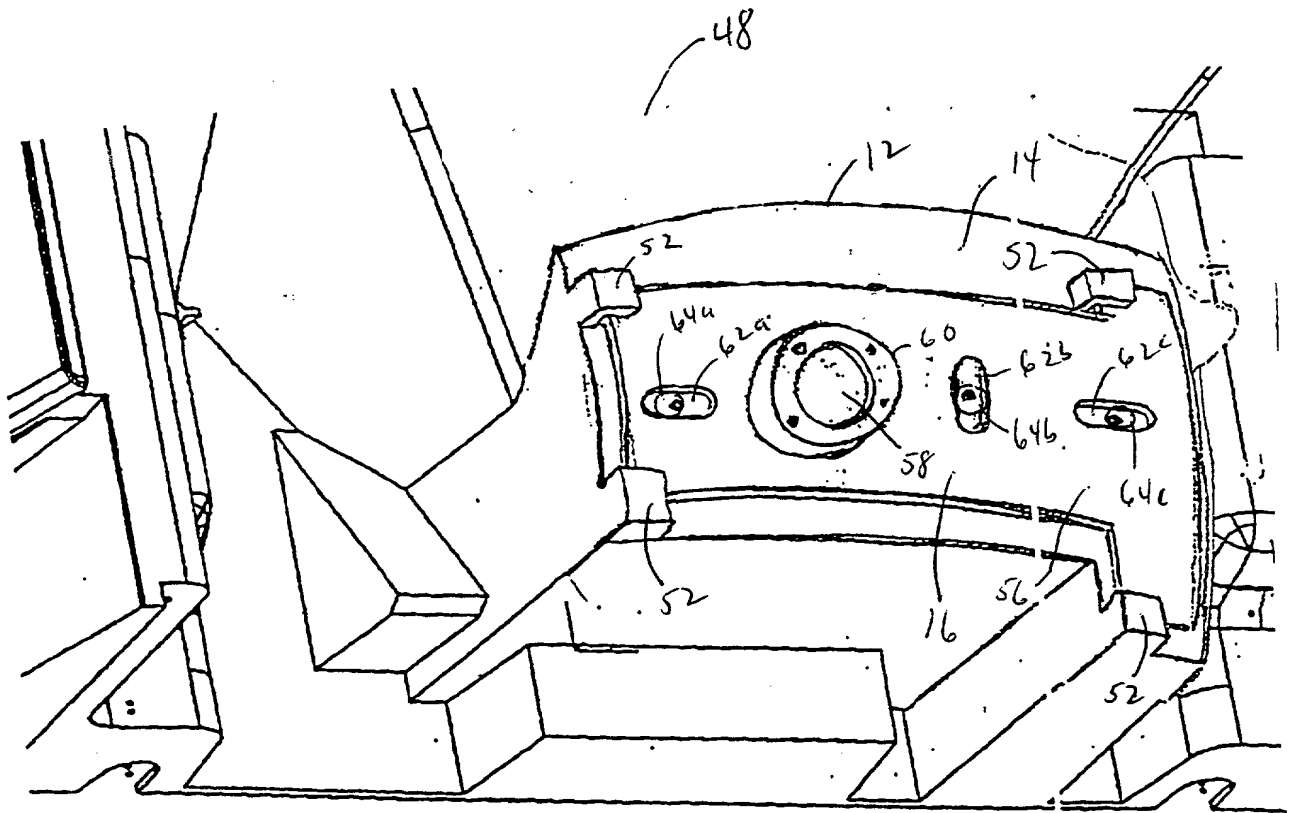


Fig. 5

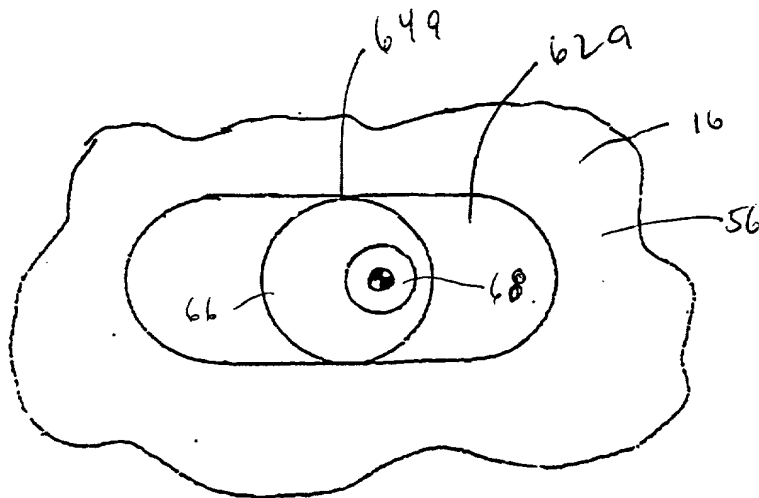


Fig. 6